DELIVERING CRITICAL COMMUNICATIONS AT SCALE



OPTIMIZING **NEXT GENERATION MISSION CRITICAL AND PRIVATE NETWORKS** USING MULTICAST TECHNOLOGY

WHITE PAPER

ENENSYS

INTRODUCTION

by RÉGIS LE ROUX,
President & CEO,
ENENSYS Technologies

It has now been 20 years since ENENSYS Technologies was founded to ride the wave of multiple innovations taking place in digital TV and mobile communications. Having developed many industry firsts within the broadcast sector since our inception in 2004, we now find ourselves well positioned to drive new innovations in the global public safety and critical communications market that will allow first responders and other critical users to take advantage of advances in 3GPP standards-based mission-critical services.

For several years now, ENENSYS Technologies has been at the forefront of research & development into the vital broadcast multicast technology – eMBMS – that enables mobile operators to deliver true critical communications at scale by allowing massive group voice, video calls and data transmissions over LTE, and soon 5G. Without such capabilities, it is hard to imagine the full transition from legacy solutions such as TETRA to the new generation.

Although eMBMS is a fundamental component of 3GPP mission-critical services from the outset, many agencies and users appear to be unaware of its benefits, or even in some cases, its very existence. For this reason, we believe the time is right to publish the following White Paper, written by our Global Head Critical Communications, Peter Clemons, who also has been a leading industry expert for almost 3 decades now. We hope you find this White Paper interesting and useful; we look forward to your feedback and stand ready to serve you over the coming months and years as we move forward together into a new critical communications world.



OPENING WORDS

by PETER CLEMONS,
Global Head Critical
Communications,
ENENSYS Technologies

I have been working in the critical communications industry for close to 30 years now, having written my first TETRA report back in 1996, before any TETRA networks had actually been deployed. TETRA, and related technologies such as P25 and Tetrapol, directly addressed the main operational requirements of public safety and professional users for immediate, secure, resilient communications within large groups, at any time, in any location.

Over time it became increasingly clear that a broadband capability would need to be added to existing communications solutions to provide greater situational awareness to critical users. Building a proprietary solution was never really a practical option so our community joined the 3GPP standardisation effort to develop a full suite of mission-critical services (MCX), initially over LTE networks, which are themselves now evolving towards 5G.

Public safety agencies in particular identified one-to-many communications as a fundamental requirement of these new mission-critical standards. ENENSYS Technologies has led this work-stream for several years now, but it is only recently that eMBMS, as it is known, has become one of the cornerstones of MCX. The main purpose of writing this White Paper is to debunk some of the myths and confusion surrounding multicast technology; explain the current state of art; ENENSYS' role and specific products and to rally the wider ecosystem to come together to deliver critical communications at scale during these most challenging and dangerous of times for Europe & the rest of the world.



COMMUNICATING IN A DANGEROUS WORLD

We live in dangerous times. The stable post-World War 2 consensus - revolving around the struggle for dominance of two competing superpowers and their zones of influence, and the emergence of the United States as the arbiter of the free world - is collapsing, and we are still not sure what will take its place. This ever accelerating, tech-driven, potentially dehumanising post-COVID world has created a widespread malaise among populations everywhere. Democratic Governments in the West in particular are in danger of losing control of their electorates, together with their ability to deliver continued prosperity.

Nation states' public services – including public protection and disaster relief (PPDR) - have been stretched to their limits by the recent global COVID-19 pandemic, which decimated parts of their populations; led to global supply chain challenges; inflationary and purchasing power pressures; and wars are now raging in Eastern Europe and Middle East, as the risk of environmental collapse still looms large. No doubt, these are dangerous times.

Over a decade ago now, it became clear to the critical communications community that mobile broadband capabilities were a must-have if we were to continue operating safely and effectively during the rapidly emerging era.

Since the turn of the Millennium, the global economy has been moving further away from the tangible, recordable exchange of goods and services towards an increasingly digital online reality. In this new reality, high-speed, high-bandwidth communications networks are mandatory for Governments, businesses and citizens to go about their daily lives. The rise of the Internet and the digital economy promise to create new forms of wealth and well-being for large parts of the global population, but also spawn new threats such as cyber-attacks, terrorism, aggressive and sometimes violent social activism, and fake news that can now spread at the same speed as the climate change-induced wildfires ravaging the physical world.

This new, increasingly inclusive, but also divisive global economy has been driven mainly by the remarkable advances of mass market cellular communications over the past 3 decades. Beginning with the truly revolutionary ETSI GSM (2G) standard that put a mobile phone in the pockets of the first billion or two global citizens, this evolution led to the 3G/4G smartphone app culture with the launch of the iPhone in 2007. We are now beginning our move towards a new genre of devices running over increasingly automated, open, software-defined networks driven by artificial intelligence in the 5G/6G era. Further widespread disruption is inevitable.

Back in the 20th century, before the mobile phone revolution, public safety agencies and other critical users tended to be at the forefront of mobile technology developments, operating publicly funded, bespoke communications systems tailored to their specific needs. The mainly voice and short data messaging-centric TETRA and P25 standards developed during the 1990s provided first responders, utilities, transport, oil and gas and industrial users with the capability to communicate almost instantaneously, over great distances, between hundreds or even thousands of users, when coordinating natural and manmade disasters.

It became commonplace for politicians and police chiefs to complain how schoolchildren now had better communication tools in their pockets than first responders heading towards a major natural disaster or terrorist event. Situational awareness had become the main requirement for agencies, so the global community joined 3GPP standardisation efforts to develop the next generation of mission critical services that would, in theory, allow public safety practitioners to take back some control over our complex, chaotic world.

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MISSION CRITICAL SERVICES: **THE MOVE TO GLOBAL STANDARDS**

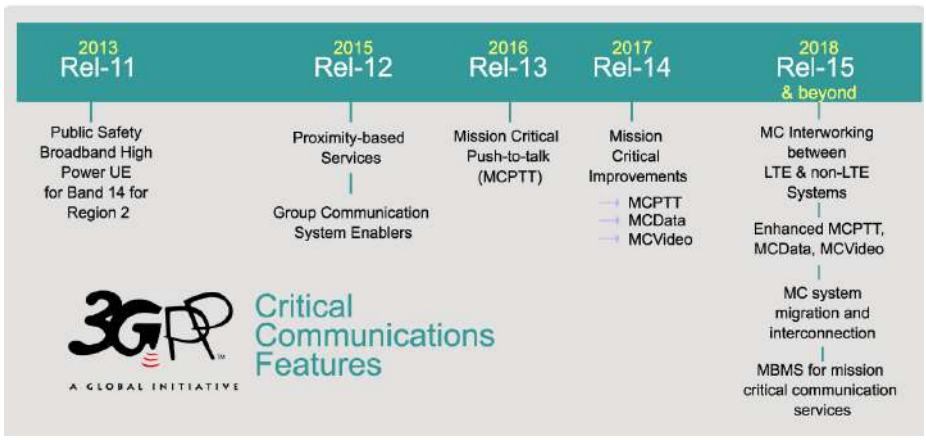


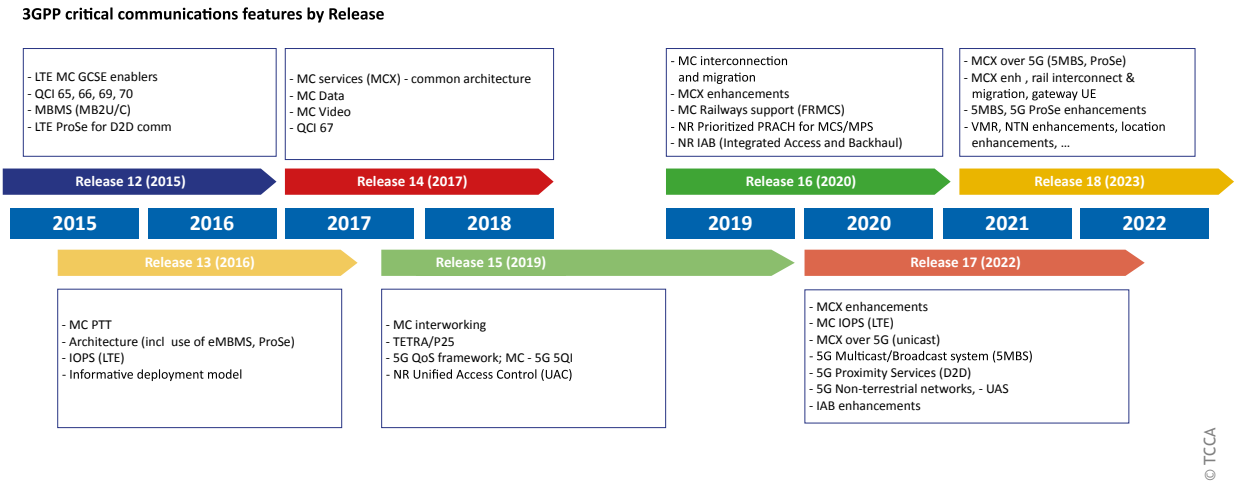
Upon their introduction into the global market, during the late 1990s and early 2000s, Professional Mobile Radio standards such as TETRA proved to be a significant step forward for critical communications users. These new narrowband standards superseded a myriad of bulky, incompatible analogue technologies that were expensive and difficult to replace with a small number of equipment and device suppliers locking customers into expensive upgrades for decades. However, it soon became clear that voice-centric solutions would quickly reach their limits in such a fast-moving world. Early attempts to squeeze faster data rates and increased bandwidth out of first-generation TETRA or P25 standards were unsuccessful, as they failed to gain traction with customers due to the additional costs and limited perceived benefits.

3GPP's 4th generation of mobile technology, LTE (Long Term Evolution) widely reuses Internet protocols for signalling, call handling, security and much more within core, radio and transport networks, moving away from the circuit-switched technology of the past towards full packet-based solutions. While searching for worthy successors to TETRA and P25, public safety agencies came across cellular push-to-talk equivalents (PoC – push-to-talk over cellular) within the Open Mobile Alliance (OMA) and helped direct them more towards their own critical needs, including IP multicast for one-to-many communications. Such efforts eventually led to OMA allowing 3GPP to licence the latest versions, as well as starting a new Working Group, SA6, dedicated to critical communications. Mission-critical push-to-talk (MCPTT) was born, leading in turn to a more comprehensive mission-critical services portfolio (MCX).

We must remember that before the arrival of the critical communications community, circa 2012, 3GPP was the domain of very powerful network equipment providers and mobile operators who carefully crafted the next release of mobile technology to serve their own needs for profitable business as well as the needs of their commercial partners and customers. The creation of SA6 during late 2014 was the first time that 3GPP agreed to develop solutions for the application layer, bringing in new expertise and a new way of working to the global organisation. Following the development of group call (GCSE) and device-to-device (ProSe) enablers within Release 12 (2014), a full suite of push-to-talk solutions was fast-tracked during the 15-month Release 13 (2016), with video and data capabilities added in Release 14 (2018).







It is often overlooked by many within the critical communications community that a solution with a typically obscure 3GPP acronym, eMBMS (Evolved Multimedia Broadcast Multicast Service), was included in the MCX specifications from the very beginning of deliberations. While recognising that 3GPP technologies offer significantly more spectrum than narrowband technologies such as TETRA or P25, LTE is still inherently unicast (one-to-one) meaning that one voice channel must be opened for each participant in a group call. This is fine for a small number of participants, but becomes a serious problem when hundreds or even thousands of first responders need to communicate with each other in an emergency.

This is where multicast (one-to-many) becomes essential. We have a lot more to say about this later.

It has now been almost 8 years since the first MCPTT specification was published and around 5 years or so since vendors started bringing full solutions to the market and testing them in ETSI Plugtests and within large-scale networks. Pioneer critical communications operations such as USA's FirstNet, UK's Emergency Services Network (ESN), Korea's SafeNet and Finland's VIRVE 2.0 have been leading the way, but it has been far from easy to match user expectations. SafeNet is the only one so far currently replacing legacy narrowband networks with public safety LTE for all its needs.

Many agencies are struggling to move out of the Proof of Concept (PoC) stage to full deployment by significant numbers of critical users during emergency situations. We believe that all the conditions are now met for this situation to change significantly in the shorter term, especially as eMBMS and its 5G equivalent are increasingly embraced by the market.

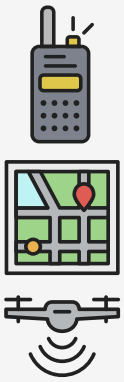
From Legacy to Broadband

Legacy PMR Systems (e.g. Tetra, Tetrapol, DMR, P25)



- Applications:
  - Push-to-Talk
  - ~~Video Sharing~~
  - ~~Data Sharing~~
- Narrowband technologies
- Natively « One-to-many »
- Proprietary

Digital and Broadband Technologies (4G/5G)



- Applications:
  - Push-to-Talk
  - Video Sharing
  - Data Sharing
- Broadband technologies
- Natively « One-to-one »
  - **« One-to-many » by enabling Multicast**
- Standardized

ENENSYS TECHNOLOGIES' **CRITICAL MISSION**

The global eMBMS leader, ENENSYS Technologies was founded in Rennes, in Western France's Brittany (Bretagne) region back in 2004: 2024 therefore marks the company's 20th anniversary. The founders shared a passion for technology and music, so it was perhaps no surprise – although definitely far-sighted - for ENENSYS' vision from the beginning to be to exploit the convergence of digital TV and telecommunications, developing a number of innovative software solutions for efficient media delivery based on industry standards.

Focused on that complex interaction between hardware and software, ENENSYS looked to optimise capacity and performance while lowering costs; to secure investments with high standards of service and monitoring; and to increase broadcasters' revenues through targeted and regional advertising. The past 20 years have taken ENENSYS on a rollercoaster ride through multiple waves of innovation, and the enterprise has managed to weather many storms to position itself as a leader in multiple market segments, including critical communications at scale with its end-to-end eMBMS solutions.

When the critical communications community joined 3GPP during the early 2010s and started developing the next generation of solutions within SA6 Working Group, the search for a long-term solution to massive group calls (one-to-many) brought an unexpected point of convergence with the broadcast industry. The leading developer of eMBMS study and work items within the 3GPP SA6 MCX stream, another French company called Expway, became an integral part of the ENENSYS family in late 2018, developing the only true end-to-end eMBMS solution, which remains the case today.

ENENSYS' **MediaCast Mobile** solution is at the heart of its offerings, implementing standard eMBMS functions in the mobile core and radio network, interacting with and authenticating the mission critical application server to convert voice, data and video traffic into synchronised multicast streams that are then sent over the network to potentially hundreds or thousands of end-user devices.

ENENSYS' **CubeAgent** product is standard 3GPP eMBMS middleware installed on smartphones and related devices, interacting and exchanging data with the radio modem and operating system, as well as the mission critical application installed on the phone to enable end users to receive more efficient multicast streams. A growing number of the world's leading brands of critical communications devices have been integrated with CubeAgent.

ENENSYS' critical communications portfolio, based on open standard protocols and interfaces, is uniquely positioned to work together with the complete mission critical ecosystem to provide the level of service, availability, redundancy and security required by the most demanding public safety agencies, as well as other critical users.

ENENSYS has also built a complete, compact LTE network in a box (**eBox**) which serves ENENSYS itself and its customers as a full portable test tool for validating content delivery - including critical communications - over LTE networks, providing the perfect environment for validation and certification processes before solutions are deployed at scale in the field.

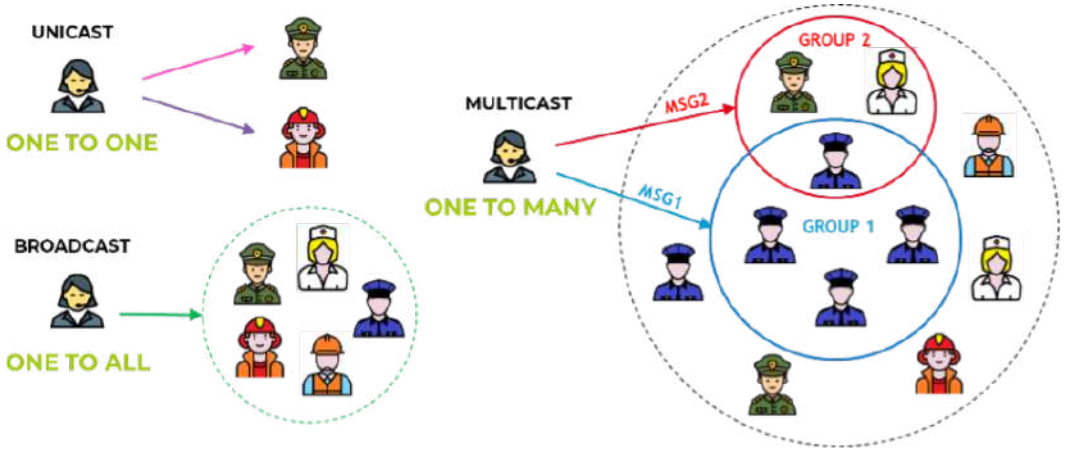
ENENSYS continues to innovate within the critical communications space as additional national critical operators mandate eMBMS for their next generation network operations. The company recently became a member of the prestigious, global TCCA association, as well as taking an active role in the ETSI 8th MCX Plugtests in Malaga during the final quarter of 2023. It is also important to mention that ENENSYS is actively engaged in 5G research and projects, working closely with leading industry partners as it consolidates its position as market leader building ever more dynamic, efficient and powerful solutions to serve customers.

EMBMS: THE 3GPP ACRONYM RIGHT AT THE HEART OF NEXT GENERATION CRITICAL COMMUNICATIONS

As this White Paper is aimed at the widest possible audience of decision makers, practitioners and active participants within the critical communications industry and its communities, we have attempted to keep technical discussions to a minimum. However, we believe that some knowledge of the basic technology underpinning eMBMS (evolved Multimedia Broadcast Multicast Service) is required, so that the reader can understand why IP-based broadcast multicast has the potential to facilitate and accelerate the transition from narrowband to broadband, finally delivering critical communications at scale.

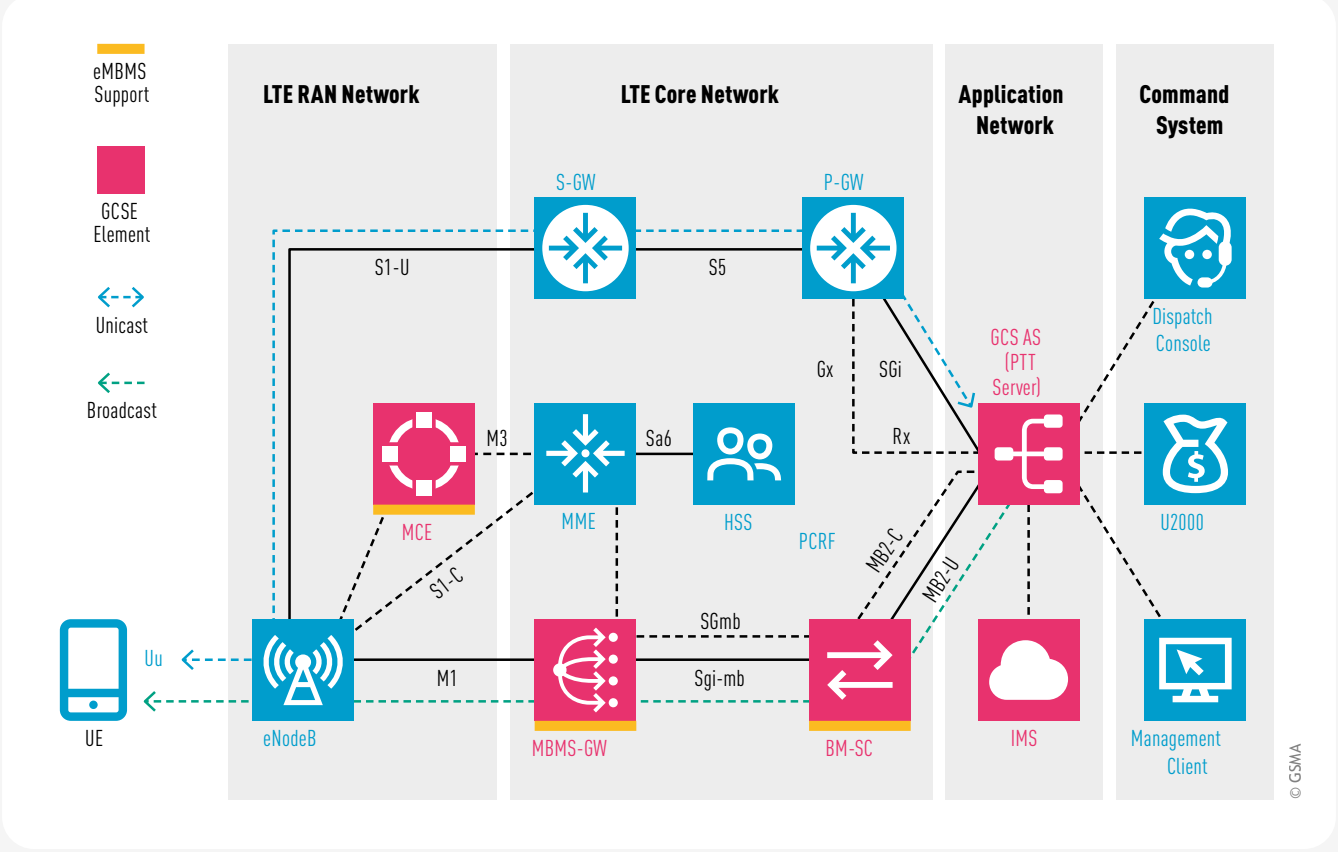
The idea of delivering broadcast content over mobile networks has a long history within 3GPP, starting as early as Release 6 during the 3G era. MBMS solutions, as they were called then, never really took off as mobile operators or broadcasters had to set aside valuable spectrum resources as well as adding dedicated hardware components to both the network and device in order to provide a service, complicating the business case justification. Further attempts were made as the 4G LTE standard was being developed in Release 9, when eMBMS was coined, but again, progress was slow.

Traditional 3GPP networks set up a "unicast" (one-to-one) call between two devices to allow signals and data to flow between them. On the other hand, broadcast networks transmit a signal to every device within a particular area without discrimination, potentially reaching devices with no desire to consume the information. Multicast has the potential to hit the sweet spot, especially for use cases involving a large group of users, allowing a group member to transmit a single stream – i.e. a voice or video call – to all other members with the same Temporary Mobile Group Identity (TMGI), reducing the radio resources required and increasing the efficiency – and capacity – of potentially congested radio cells during emergencies.



eMBMS transmits an identical signal at the same time to multiple destinations over a Multicast Broadcast Single Frequency Network (MBSFN) consisting of multiple cells. The LTE network architecture requires three new main logical entities: the Broadcast Multicast Service Centre (BMSC), which authenticates and authorises the content provider (application server) and user (device); MBMS Gateway, that distributes the data stream from BMSC to radio base stations via IP Multicast and Multi-cell/Multicast Coordination Entity (MCE) that allocates radio resources using MBSFN. Several new physical and logical radio channels are also specified by 3GPP, as well as standard protocols and interfaces.

Optional architecture of mission critical communications over LTE



It is true that early eMBMS trials and implementations failed to reach industry expectations as nationwide and regional mobile operators and broadcasters looked to reach millions of subscribers with innovative, compelling services to entertain them and convince them to take out lucrative subscriptions. Even within parts of the critical communications community, eMBMS is not well-known and deciders fear its potential limitations.

However, this perception is changing. The standards and real-world solutions continue to evolve to cater to new use cases, especially in the MCX arena. 3GPP MooD (Multicast Operation on Demand) allows spectrum resources and group identities to be allocated dynamically as and when required, reducing the time needed to switch from unicast to multicast and then back to unicast. Further developments are underway within 5G to allow multicast to be deployed more efficiently and seamlessly within the 5G architecture, opening up more industry sectors and use cases and creating a more viable, and valued long-term solution.

Most importantly, ENENSYS is building a complete ecosystem together with a lengthening list of industry partners, including core and RAN network equipment manufacturers, critical operators, MCX solution providers, device manufacturers and core technology developers. The fruits of this closer collaboration were seen most clearly at the recent ETSI MCX Plugtests held in Malaga, Spain where ENENSYS integrated its solutions with as many as a dozen different partners from across the industry, successfully demonstrating full eMBMS capabilities to public safety agencies and other observers. ENENSYS is fast becoming a catalyst for real change, bringing critical communications at scale ever closer to reality.

→ **See more:**
https://portal.etsi.org/Portals/0/TBpages/CTI/Docs/8th_ETSI_MCX_Plugtests_Report_V110.pdf



MULTICAST'S MULTIPLE BENEFITS FOR CRITICAL COMMUNICATIONS

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Full wide-area urban, suburban and remote rural coverage – outdoors and indoors – and close to 100% service availability are non-negotiable requirements for all critical users. In the current telecommunications climate, prime, dedicated spectrum for LTE Advanced or 5G services in the highly prized sub-1GHz frequencies is highly valued and in short supply. Critical operators are unlikely to receive more than 2x10 MHz at best, which is not enough to guarantee massive mission critical PTT services, essential for the eventual replacement of legacy solutions.

Even if permission is granted to allow priority access to the large swathes of spectrum owned by commercial operators, it is now becoming clear that key performance indicators (KPIs) cannot be guaranteed for fundamental mission critical services. The case for taking a very close look at multicast solutions based on eMBMS, evolving to 5G MBS, therefore becomes ever more compelling.

ENENSYS has identified several, often interconnected benefits for implementing end-to-end multicast solutions to optimize mission critical and private networks (there are probably many more!):

- To avoid network saturation and the risk of service disruption, critical operators are often forced to over-dimension the underlying network, building additional sites and increasing capacity, leading to spiralling costs and unacceptable inefficiencies. Multicast can dynamically offload massive group calls during emergencies, helping reduce spikes in demand, keeping the network operational at all times.

- Network operators are reluctant to implement new bandwidth-hungry services such as video and massive data into an operational network, due to fears that basic service provision will be disrupted. Multicast prevents multiple, identical video streams being sent to users within the same area, enabling service innovation and much greater quality of experience (QoE) for critical users.

- At the scene of a major incident, hundreds of emergency personnel communicating via unicast will not receive the same message at precisely the same time, leading to an irritating cacophony of noise, or maybe a tragic delay that eliminates the "don't" from "don't shoot"! Multicast provides that vital, single, synchronised, unambiguous stream of information to all first responders.

- Guaranteeing QPP (Quality of Service, Priority and Preemption) over LTE networks by implementing network functions for policy control (PCRFs in 3GPP-speak) can be extremely expensive for network operators, as well as denying access to the network for ordinary citizens to contact emergency services or loved ones in times of extreme stress. Multicast can offload and guarantee emergency communications, freeing up network resources for everyone.

- By implementing an end-to-end multicast solution in the core network and on a wide range of devices, there is no longer a need to provide the same potentially more costly specialised, ruggedised device to all personnel within an organisation, regardless of their rank or function. This increases comfort for users, saves money and once again increases quality of experience.

- Finally, and perhaps most importantly, carbon footprints must be slashed by all sectors to reach challenging net zero goals in the hope of saving the planet from catastrophic climate change. It is therefore no longer acceptable, nor is it financially viable, for network operators to use more spectrum resources than are absolutely necessary to provide a service, however critical. Multicast is a cost-effective, green solution, offloading critical traffic at peak times and reducing greenhouse gas emissions.

ENENSYS is committed to developing better, smarter, safer, greener solutions for critical communications. Even as we move to 5G, 6G and beyond, regardless of improvements in capacity, performance and reliability, multicast will remain an essential feature in state-of-the-art networks.

MULTICAST IS BECOMING **A MAINSTREAM SOLUTION** FOR CRITICAL COMMUNICATIONS

Early efforts within 3GPP to develop broadcast/multicast solutions were focused on offering entertainment services to the mass market over often inconsistent 3G networks. Competing technology standards and proprietary solutions were also developed in parallel, but it must be admitted that the ultimate results were disappointing.

Once eMBMS was included within the 3GPP LTE Advanced MCX standards, several pilots and trials were carried out around the world, with varying degrees of success. From the beginning, multicast faced a real challenge because of its very nature and what it is trying to achieve. eMBMS becomes a necessity precisely in those situations where critical communications need to be delivered at scale, in great numbers, when the network is under stress, and yet, many agencies prefer to move forward without eMBMS in the early stages, when network traffic is lower and unicast seems adequate to test out basic functionality.

It is only later, when network operators attempt to scale up operations to hundreds and thousands of users, that they hit a limit they often cannot fix without multicast. However, it is obviously much harder to implement a full multicast solution when a network is already operational! eMBMS is not a panacea for all situations, but it is undoubtedly an important component within the overall toolkit available to mission critical teams.

Following its introduction, eMBMS has already been deployed in some of the pioneer public safety networks around the world. Korea's SafeNet, USA's FirstNet and MoI Qatar have all incorporated broadcast multicast solutions into their existing public safety LTE networks to optimise the delivery of critical communications at scale. These early deployments have provided valuable feedback to developers, who continue to tweak and enhance real-world solutions.

Multiple public safety agencies within Europe have decided to mandate eMBMS for their next generation mission critical networks. Due to the limited spectrum available, Spanish Ministry of Interior identified eMBMS as an essential requirement for the broadband upgrade to their SIRDEE network. The Ministry is working closely with their network provider, Telefonica and key industry partners to make sure eMBMS is implemented throughout the new network. Belgian critical operator, ASTRID has also mandated eMBMS for the dedicated part of its future hybrid broadband network. It is likely that several other agencies will take similar decisions over the coming months and years.

A complete, global ecosystem is required to achieve the necessary economies of scale and mass deployment of 4G/5G multicast. This ecosystem, in addition to multicast specialists such as ENENSYS, relies on chipset manufacturers; core and access network suppliers; plus mission critical application developers, handset manufacturers, and of course, advocates within the critical communications community itself, from key decision makers to engineers, marketing departments and industry experts.

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eMBMS is - and will always be - a collective effort. If any part of the value chain fails, then the solution is unlikely to reach its full potential, meaning that many use cases will not be delivered optimally and true critical communications at full scale might remain out of reach. ENENSYS Technologies is fully committed to leading this industry effort to make eMBMS mainstream, as well as working with all our partners to continually improve the solution for the 5G era and beyond.

For multicast to reach its full potential it also needs to succeed beyond the public safety sector. There is enormous, as yet untapped potential across a wide range of industry sectors, such as transportation (railways, maritime, logistics); utilities (electricity, gas, water); the extractive industries such as mining and oil and gas.

The size of the private network market continues to grow as more solutions become available due to network virtualisation, software-defined networking, edge computing, AI/ML and exciting new applications such as IoT, AR/VR, drones, automated guided vehicles, robotics, video surveillance and much, much more. Multicast is agnostic to data flows or specific applications, focusing on efficient media delivery in all its forms. There is no sign that the demand for such applications will be slowing down anytime soon.



UNLOCKING THE FUTURE OF CRITICAL COMMUNICATIONS

We have used the term "critical communications" a lot during this White Paper, without giving it a precise definition. Terms change over time, especially during times of dramatic change such as those we are living through. The term "critical" is in danger of being overused simply to describe any procedures and activities that are the most important for any organisation's mission. In our specific case, a few milliseconds of delay in communicating important information could be the difference between life and death. First responders must be equipped with the best possible tools for the task in hand, and no tool is more ubiquitous or more essential than the one – or ones – they use to communicate.

For well over a decade, the global community has been on a collective mission to develop, deliver and operate the next generation of critical communications technology based on 3GPP standards. Thousands of dedicated public and private individuals, often from competing businesses or organisations, volunteering significant time and energy, regularly come together to work towards a common goal.

Standards bodies such as 3GPP, ETSI, NIST; industry associations such as TCCA, PSC Europe, APCO; and a growing number of public and private initiatives play host to equipment suppliers, network operators, Government agencies, software developers, cybersecurity experts, intelligence agencies and the like in open forums, conferences, bars and restaurants, boardrooms, airport lounges and hotels. We all come together to share new ideas, best practices, technological breakthroughs, successes and failures, in the hope that, by pooling common resources and thousands of years of expertise, we will deliver solutions that satisfy the needs of first responders and other critical users for years, or decades to come.

A significant recent development within the European Union has been the creation of the Mission Critical Communications Group (MCCG) and the European Commission-funded BroadEU. Net programme to deliver the European Union Critical Communications System (EUCCS), which is being watched closely by Governments and agencies from across the world.

We have defined hundreds of requirements over the past decade or so. Some may be perceived as more important than others: massive group call procedures; off-network communications, i.e. device-to-device/sidelink; emergency calls; encryption algorithms; perhaps interworking functions; some may be mandatory, optional or simply nice-to-have. It is for the user to decide.

As we move forward, some general trends are becoming clear (no doubt you can add many more):

- Voice/PTT is essential, but no longer enough in an increasingly automated world where humans interact with machines, and machines interact with other machines to produce certain outcomes.
- Video and massive data are becoming mission critical in this new world of diverse devices providing feedback for more accurate situational awareness.
- Prime spectrum resources need to be used more wisely and efficiently, with perhaps some form of dynamic sharing to optimise their use and create greener, more sustainable outcomes. The increased adoption of AI techniques across access and core networks will help here.
- We will need to cooperate even more than we do now across a complex ecosystem, while securing and protecting data flows, personal information and identities.

Technology alone will not solve the challenges of our time. Adding more buzzwords or acronyms to our standards documents or business plans will not necessarily take us to where we want to go. Each participant in the process must commit to bringing their best solutions to the table and combining them in the best manner possible with the best solutions of every other participant until we have something we can all be happy with. ENENSYS Technologies is committed to contributing to this collective effort by bringing our particular speciality to the table: fully functional, end-to-end standards-based broadcast multicast solutions that guarantee efficient media delivery at the most critical of times.

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FULFILLING THE PROMISE OF CRITICAL COMMUNICATIONS AT SCALE

We have come a long way on our journey, without arriving yet at our final destination. Perhaps we never will, as the critical communications solutions we develop become more modular, flexible and continuously evolve over time. Perhaps the most important decision that has been taken so far was to choose the 3GPP path to full, secure mobile broadband.

It is clear that the only way to achieve our goals will be to implement the 3GPP MCX standards in full. These must also be revised and updated at each stage of the continued development of mobile standards in general to make sure we never find ourselves again in a technological cul-de-sac.

An important part of these standards is the broadcast multicast component, simply because this appears to be the only mechanism we have for delivering massive mission critical voice, data and video under all circumstances. The current best practice is eMBMS, with the road to 5G Multicast Broadcast Services and beyond currently being refined within the 3GPP framework.

With each new iteration of the standards, the opportunity exists to integrate IP multicast into the underlying core and access networks – as well as devices and applications – allowing it to be dynamically interchangeable with unicast and broadcast capabilities, depending on the situation in which specific users and groups of users find themselves. The separation of hardware and software, control plane and user plane and the steady introduction of greater intelligence – artificial or otherwise – will help us to make this process increasingly transparent to the user. Having played a key role in developing the original eMBMS suite, ENENSYS Technologies is committed to continuing to develop and evolve the very best and most efficient media delivery solutions, together with its partners and the wider ecosystem.

By working together and being sensitive to the needs of critical users; conscious of our social and environmental responsibility; resolute in our support of a greener, safer, fairer digital society and economy; we will finally be able to deliver on the full promise of critical communications at scale.



WE **OPTIMIZE** | WE **SECURE** | WE **MONETIZE**

About ENENSYS Technologies

For nearly 20 years, the ENENSYS Technologies Group has been accompanying its international customers in the evolution of uses and technologies. ENENSYS offers highly innovative solutions for efficient content distribution in several ecosystems: Targeted Advertising, Streaming, Terrestrial Broadcasting, Satellite Communications and Critical Communications. With approximately €60M invested in R&D over the past 10 years, the Group has a reputation for excellence in video stream optimization, security, and monetization solutions. The solutions are marketed through two brands - ENENSYS and TestTree - and reach over 1.2 billion viewers worldwide. The Group achieved a turnover of 12.1 M€ in 2023, more than 80% of which was generated internationally.

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